Reasons for Allowance

1.　　Claims 18-20, 23-25, 27-29, 41-64 are allowed.

2.　　Claims are considered allowable since when reading the claims in light of the specification, as per the MPEP §2111.01 or Toro Co. v. White Consolidated Industries Inc., 199 F.3d 1295, 1301, 53 USPQ2d 1065, 1069 (Fed Cir. 1999), None of the references of record alone or in combination disclose or suggest the combination of limitations specified in the independent claims including, 'an interface to tune the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end user of the storage system' as in claim 18 as defined in the specification (patent publication) in paragraphs 0129 and 0131.

In claim 25, 'tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system' as defined in the specification (patent publication) in paragraphs 0129 and 0131.

In claim 41, 'an interface to tune the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end user of the storage system' as defined in the specification (patent publication) in paragraphs 0129 and 0131.

In claim 47, 'an interface to dynamically adjust a predefined quality threshold of the determination module at runtime in response to input from an end-user, thereby adjusting the degree of data loss risk and remedial costs associated with a forecasted failure of one or more components' as defined in the specification (patent publication) in paragraphs 0129 and 0131.

In claim 52, 'the machine-readable code comprising an interface to selectively adjust a fuzzy variable definition to tune the failure prediction algorithm dynamically at runtime in response to input from an end-user of the storage media and the drive mechanism.'

In claim 56, 'means for dynamically tuning the failure prediction algorithm at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system' as defined in the specification (patent publication) in paragraphs 0129 and 0131.

In claim 61, 'tuning the failure prediction algorithm dynamically at runtime by adjusting a fuzzy variable definition in response to input from an end-user of the storage system' as defined in the specification (patent publication) in paragraphs 0129 and 0131.

3.   A practical application for the invention is disclosed within the abstract for developing failure prediction software. It is assumed that all method claims are implemented by a computer.

4.   The closest prior art teaches ('Application of fuzzy logic to reliability engineering':

Bowles) in claim 18 a method for developing failure prediction software for a storage

system, the method comprising: assisting an end user of a storage system in generating

a failure prediction algorithm for the storage system, the failure prediction algorithm

comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language

format. (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract; 'Failure

prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault

trees, event trees, the reliability of degradable systems, and the assessment of system

criticality based on the severity of a failure and its probability of occurrence' of Bowles.

'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language

format' of applicant is equivalent to 'natural language expressions' of Bowles.)

          In claim 25 executing a failure prediction algorithm on the performance data to

produce a result, the failure prediction algorithm comprising fuzzy logic rules generated

by an end-user of the storage system, the fuzzy logic rules defined by conditional

statements that include subjects, adjectives, and verbs familiar to personnel in the

storage system field. (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract;

'Failure prediction algorithm' of applicant is equivalent to 'analysis of system structures,

fault trees, event trees, the reliability of degradable systems, and the assessment of

system criticality based on the severity of a failure and its probability of occurrence' of

Bowles. 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural

language format' of applicant is equivalent to 'natural language expressions' of Bowles.)

In claim 41 an apparatus for developing failure prediction software for a storage system, comprising: an editor to assist an end-user of a storage system in generating a failure prediction algorithm comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language format. (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract; 'Failure prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault trees, event trees, the reliability of degradable systems, and the assessment of system criticality based on the severity of a failure and its probability of occurrence' of Bowles. 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language format' of applicant is equivalent to 'natural language expressions' of Bowles.)

In claim 47, a processor to execute a failure prediction algorithm on the performance data to produce a result, the failure prediction algorithm comprising fuzzy logic rules generated by an end-user of the storage system. (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract; 'Failure prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault trees, event trees, the reliability of degradable systems, and the assessment of system criticality based on the severity of a failure and its probability of occurrence' of Bowles. 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language format' of applicant is equivalent to 'natural language expressions' of Bowles.)

In claim 52, an analysis module to execute machine-readable code programmed to selectively predict failure of the storage media and the drive mechanism in response to a result from a failure prediction algorithm comprising fuzzy logic rules and

performance data associated with the storage media and the drive mechanism.

(**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract; 'Analysis module' of

applicant maps to 'the analysis of system reliability' of Bowles. 'Failure prediction

algorithm' of applicant is equivalent to 'analysis of system structures, fault trees, event

trees, the reliability of degradable systems, and the assessment of system criticality

based on the severity of a failure and its probability of occurrence' of Bowles. 'Fuzzy

logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language format'

of applicant is equivalent to 'natural language expressions' of Bowles.)

     In claim 56, an apparatus for developing failure prediction software for a storage

system, comprising: means for assisting an end-user of a storage system in generating

a failure prediction algorithm comprising fuzzy logic rules, the failure prediction

algorithm stored in a natural language format. (**Bowles,** p448, C2, p435 C2:20 through

p436 C1:14, abstract; 'Failure prediction algorithm' of applicant is equivalent to 'analysis

of system structures, fault trees, event trees, the reliability of degradable systems, and

the assessment of system criticality based on the severity of a failure and its probability

of occurrence' of Bowles. 'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of

Bowles. 'Natural language format' of applicant is equivalent to 'natural language

expressions' of Bowles.)

     In claim 61, An article of manufacture comprising a program storage medium

readable by a processor and embodying one or more instructions executable by a

processor to perform a method for developing failure prediction software for a storage

system, the method comprising: assisting an end-user of a storage system in generating

a failure prediction algorithm for the storage system, the failure prediction algorithm

comprising fuzzy logic rules, the failure prediction algorithm stored in a natural language

format. (**Bowles,** p448, C2, p435 C2:20 through p436 C1:14, abstract; 'Failure

prediction algorithm' of applicant is equivalent to 'analysis of system structures, fault

trees, event trees, the reliability of degradable systems, and the assessment of system

criticality based on the severity of a failure and its probability of occurrence' of Bowles.

'Fuzzy logic rules' of applicant is equivalent to 'fuzzy logic' of Bowles. 'Natural language

format' of applicant is equivalent to 'natural language expressions' of Bowles.)

Complementary art teaches ('Improved disk drive failure warnings': Hughes) in

claim 18 generating machine readable code from the stored failure prediction algorithm

in response to input from an end-user, the machine-readable code configured to

execute on the storage system. (**Hughes,** p350, C2:35 through P351, C1:4; The ability

to 'generate machine readable code' of applicant is equivalent to running the 'SMART'

application of Hughes.)

In claim 25, selectively forecasting failure of one or more components of the

storage system in response to the result. (**Hughes,** abstract; 'forecasting failure of a

storage system' of applicant is disclosed by 'disk drive failure prediction' of Hughes.)

In claim 41, a code generator to generate machine-readable code from the

stored failure prediction algorithm in response to input from an end-user. (**Hughes,**

p350, C2:35 through P351, C1:4; The ability to 'generate machine readable code' of

applicant is equivalent to running the 'SMART' application of Hughes.)

In claim 47, a determination module to selectively forecast failure of one or more components of the storage system in response to the result. (**Hughes,** abstract; 'forecasting failure of a storage system' of applicant is disclosed by 'disk drive failure prediction' of Hughes.)

In claim 52, a system for predicting component failure within a storage system, the system comprising: a controller to control and manage data transactions with a host (**Hughes,** p351 C1; 'Controller to control and manage data transaction' of applicant maps to 'SMART is checked on computer bootup by the CMOS/BIOS firmware' of Hughes.); a communication module to exchange data between the host and a storage media. (**Hughes,** p351 C1; If Hughes can run SMART during bootup by CMOS/BIOS then it is inherent that there exists a 'communication module' of applicant.); a drive mechanism to read data from the storage media and write data to the storage media. (**Hughes,** abstract; 'drive mechanism' of applicant maps to 'disk drives' of Hughes.)

In claim 56, means for generating machine-readable code from the stored failure prediction algorithm, the machine-readable code configured to execute on the storage system. (**Hughes,** p350, C2:35 through P351, C1:4; The ability to 'generate machine readable code' of applicant is equivalent to running the 'SMART' application of Hughes.)

In claim 61, generating machine-readable code from the stored failure prediction algorithm in response to input from an end-user, the machine-readable code configured to execute on the storage system. (**Hughes,** p350, C2:35 through P351, C1:4; The ability to 'generate machine readable code' of applicant is equivalent to running the 'SMART' application of Hughes.)

Complementary art teaches ('Fuzzy rule based expert system for power system fault diagnosis': Monsef) in claim 18, testing the machine-readable code with sample data to produce a result in response to input from an end-user. (**Monsef,** p186 C2:26-36; 'Testing … with sample data to produce a result' of applicant is equivalent to 'simulation' of Monsef.)

In claim 41, a test module to test the machine-readable code with sample data to produce a result in response to input from an end-user. (**Monsef,** p186 C2:26-36; 'Testing … with sample data to produce a result' of applicant is equivalent to 'simulation' of Monsef.)

In claim 56, means for testing the machine-readable code to produce a result. (**Monsef,** p186 C2:26-36; 'Testing' of applicant is equivalent to 'simulation' of Monsef.)

In claim 61, testing the machine-readable code with sample data to produce a result in response to input from an end-user. (**Monsef,** p186 C2:26-36; 'Testing … with sample data to produce a result' of applicant is equivalent to 'simulation' of Monsef.)

Complementary art teaches (U. S. Patent 5832467: Wavish) in claim 18, selectively revising the failure prediction algorithm in response to input from an end-user such that the result corresponds to an expected result (**Wavish,** C9:54-67, C2:5-26; 'Selectively revising' an 'prediction algorithm' of applicant is equivalent to 'selectively modify … until a level of accuracy in accordance with said predetermined criteria' of Wavish.)

In claim 41, a revision module to allow revisions of the failure prediction algorithm in response to input from an end-user such that the result corresponds to an expected result (**Wavish**, C9:54-67, C2:5-26; A revision module for an 'prediction algorithm' of applicant is maps to 'selectively modify ... until a level of accuracy in accordance with said predetermined criteria' of Wavish.)

In claim 56, means for selectively revising the failure prediction algorithm in response to input from an end-user such that the result corresponds to an expected result (**Wavish**, C9:54-67, C2:5-26; 'Selectively revising' an 'prediction algorithm' of applicant is equivalent to 'selectively modify ... until a level of accuracy in accordance with said predetermined criteria' of Wavish.)

In claim 61, selectively revising the failure prediction algorithm in response to input from an end-user such that the result corresponds to an expected result (**Wavish,** C9:54-67, C2:5-26; 'Selectively revising' an 'prediction algorithm' of applicant is equivalent to 'selectively modify ... until a level of accuracy in accordance with said predetermined criteria' of Wavish.)

Complementary art teaches ('Fixed time life teats based on fuzzy life characteristics': Kanagawa) in claim 25, a method for predicting component failure within a storage system, the method comprising: gathering performance data for a storage system. (**Kanagawa**, p317, C2:7-16; 'Gathering performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa.)

In claim 47, an apparatus for predicting component failure within a storage system, the apparatus comprising: a performance monitor to gather performance data for a storage system. (**Kanagawa,** p317, C2:7-16; 'Gathering performance data' of applicant is illustrated by the ability to have 'n items be drawn at random' of Kanagawa.)

5.   Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement for Allowance."

6.   Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Peter Coughlan whose telephone number is (571) 272-5990, Monday through Friday from 7:15 a.m. to 3:45 p.m. or contact the supervisor Mr. David Vincent at (571) 272-3080.

/P. C./

Examiner, Art Unit 2129

Peter Coughlan

Patent Examiner

10/2/2009

/David R Vincent/
Supervisory Patent Examiner, Art Unit 2129